PAYING ATTENTION TO PUPILS WITH ADHD

A guide for teaching assistants

Daniel Glover and **Louisa Horner**

Attention Deficit Hyperactivity Disorder (ADHD) is a neurobiological disorder associated with symptoms of persistent inattention, hyperactivity and impulsivity which can have an influence on personal, academic, familial and societal functioning (ADHD Institute, 2016). Believed to be the most common behavioural disorder in the UK (National Health Service, 2014), it is thought that ADHD currently affects 3.62 per cent of boys and 0.85 per cent of girls aged between 5-15 years (The UK ADHD Partnership, 2013). Therefore, boys are nearly four times more likely to have ADHD than girls, demonstrating a greater need to focus on boys within the school physical education (PE) environment. McCarthy *et al.* (2012) stated that the annual prevalence of 6-12 year old boys who were pharmacologically treated for ADHD increased from 8.15 (per 1,000) in 2003 to 15.32 (per 1,000) in 2008. Further evidence by Holden *et al.* (2013) noted an increase in diagnosis for ADHD in 6-17 year old children from 192 to 506 per 100,000 between 1998 and 2007.

Holden *et al.* (2013) revealed that 65 per cent of people with ADHD possessed one or more other co-morbidities, such as dyslexia, developmental coordination disorder, and conduct and oppositional defiant disorders. Current treatments for ADHD mainly consist of pharmacological interventions and behaviourally-based psychosocial treatments. Methylphenidate is the most common drug used, however 20 per cent of children develop side effects such as sleep problems and mood disturbances (Kiluk *et al.*, 2009). Psychosocial treatments typically consist of school and parent-based management training and cognitive behavioural therapy. All of these interventions have been shown to be effective in reducing inattention, hyperactivity and impulsivity characteristics, yet results are short-lived (Berwid and Halperin, 2012). Interestingly, there is a growing body of evidence that considers the use of exercise as a treatment.

Educational teaching assistants (ETAs) who work with children with ADHD, most commonly on a one-to-one basis during curriculum time, are the primary focus of this article, and more specifically those who support pupils within PE lessons. In order to facilitate inclusion ETAs need to fully understand the condition, its effects on the child, and possible strategies to help reduce the severity of symptoms during PE. It is vital that pupils with ADHD have the necessary support in place to enable a positive learning experience. Coates and Vickerman (2008, p.169) noted the thoughts of PE teachers which indicated that the presence of ETAs who were inexperienced in the subject area was more of a hindrance than a help. The PE teachers also suggested that ETAs' lack of specific PE training led to lack of confidence, resulting in ADHD pupils receiving a poorer PE experience. However, their presence allowed PE teachers to focus on the "lesson and other children in it".

Children with ADHD are thought to have a smaller brain volume. Carmona *et al.* (2005) noted an average brain volume reduction of 5.4 per cent when compared to children without ADHD. This neurobiological disorder is also associated with an imbalance of norepinephrine and dopamine, which are neurotransmitters found in the brain. Wigal *et al.* (2013) found an increased level of dopamine in children with ADHD as a result of exercise, leading to enhanced focus and attention, and consequently facilitating learning. The same study also suggested that exercise increased levels of norepinephrine, thus improving executive operations, reducing distractibility, and enhancing memory, all of which assist in learning. Robinson *et al.* (2011) suggested that exercise and physical activity can alter dopamine and norepinephrine transmission, therefore reducing the severity of ADHD symptoms.

Due to the reduction in brain volume and differing brain activity levels, ADHD is associated with a number of cognitive deficits. Physical activity can alter a child's brain structure and function and, as a consequence, improve the efficiency of information processing, executive control and memory (Tomporowski, 2016). An exploratory study by Verret *et al.* (2012) found that long-term physical activity positively influenced strength and motor skills, in addition to behaviour and cognitive functions. Similarly, Neudecker *et al.* (2015) discovered that higher rates of physical activity improved cognitive performance. This suggests a positive outcome on academic performance if physical activity is performed regularly. ETAs could utilise small-scale physical activity within the classroom to enhance the child's attention and improve engagement in lessons.

Children with ADHD may find it difficult to perform complex motor skills that children without ADHD find relatively easy because approximately 50 per cent of children with ADHD have developmental coordination disorder (DCD) (Bishop and Block, 2012). This delay in motor skill development leads to the avoidance of practice during both PE and physical activity. This highlights the need for ETAs to promote simple motor skills during PE lessons, making them specific to each pupil's skill level, subsequently improving inclusivity and self-efficacy. Breaking down skills into bite-

size chunks could facilitate success. Hoza and Smith (2015) promoted the use of aerobic physical activity to reduce the risk of poor motor skills and lower fitness levels in children with ADHD. Evidence provided by Lufi and Parish-Plass (2011) and Barkley *et al.* (2014) stated that physical skills and athletic ability are highly valued when forming relationships and being accepted by peers. Therefore there is a need for regular practice in developing basic motor skills by children with ADHD in order to reduce or prevent social isolation, and help improve their confidence in sport and physical activity.

Psychiatric and behavioural co-morbidities are widely associated with ADHD. Jarrett *et al.* (2016) provided evidence that 25 per cent of children with ADHD possessed anxiety disorders, while 50 per cent presented symptoms of oppositional defiant disorder (ODD) and conduct disorder (CD). These disorders can negatively affect participation in sports through low self-esteem and difficulty following and accepting rules. Additionally, participation in team sports exacerbated levels of aggression, emotional reactivity and disqualification (Johnson and Rosen, 2000). Contradictory evidence by Kiluk *et al.* (2009) showed that parents reported anxiety and depressive symptoms when their child played three or more sports – the types of activities performed were not provided.

ADHD is also associated with impulsivity, anger and childhood aggression (Becker *et al.*, 2012). Becker *et al.* (2012) also found that when ADHD and anxiety were combined, this produced the highest levels of aggression due to compounding impairment of inhibitory control. Such behaviours during any type of physical activity may present a heightened risk to the child and other pupils, and a greater chance of removal from the situation. Symptoms of anxiousness during childhood have been seen to exacerbate disruptive behaviours, leading to diagnoses of disruptive behaviour disorders, in turn exacerbating anxiety symptoms(Bubier and Drabick, 2009). This vicious circle needs to be addressed during physical activity as sessions of higher stress may induce emotional outbursts associated with aggression. Therefore ETAs should facilitate sessions that induce minimal stress, and focus on simple motor skills to prevent anxious and aggressive behaviours. Anger and aggression can result in children's inability to cope in sports and physical activity with peers, with the long-term consequence being social isolation and peer-rejection (O'Callaghan *et al.*, 2003).

Participation in sport for the general population has resulted in marked improvements in social behaviours, such as sportsmanlike and attentive behaviours, when implementing a reward. Studies by Stark *et al.* (2011) and van Meel *et al.* (2011) found increased brain activation when pupils and students with ADHD were given a monetary reward. ETAs could adapt this system by rewarding positive social behaviours with tokens; pupils could exchange these to 'purchase' treats. Adopting this strategy may help to alleviate negative behaviours and help develop friendships with peers when participating in PE.

Children with ADHD are also at a greater risk of developing depression, with co-morbid depression found in 20-30 per cent of ADHD cases (Ushijima *et al.*, 2012). Humphreys *et al.* (2013) provided evidence that children with ADHD fare worse academically and socially. They reported that failure in both these areas contributed to depression. A growing body of evidence suggests that physical exercise can reduce the symptoms of depression. Schuch *et al.* (2011) undertook a systematic review that supported exercise as a treatment to improve the physical and psychological quality of life in depressed individuals. With this in mind, exercise should be performed regularly by children with ADHD who are at greater risk of depression. More specifically, Perraton *et al.* (2010) suggested that aerobic exercise lasting more than 30 minutes aided the reduction of depressive symptoms; however, the studies considered within the review focused on adults.

Disturbed sleep is also commonly reported in children with ADHD as well as a greater difficulty in falling asleep and increased tiredness upon waking (Hoban, 2000). Persistent sleep loss can cause or exacerbate learning, emotional and behavioural problems for children with ADHD (Montgomery and Wiggs, 2015, Hansen *et al*., 2014) and all of these can negatively affect participation in PE and physical activity. Medication, such as Methylphenidate, commonly prescribed for ADHD, may also affect sleep patterns. This can make participation in physical activity more difficult due to low energy levels. ETAs should avoid long, tiring physical activity sessions to prevent the exacerbation of behavioural and emotional problems. Archer *et al*. (2012) identified that short exercise bouts of 5-15 minutes reduced both hyperactivity and behavioural disturbances. Additional evidence from Tatsumi *et al*. (2015) demonstrated that morning and afternoon physical activity improved the sleep quality of children with developmental disorders.

Children with ADHD may also find it difficult to integrate and cope with some sports and team games, due to high levels of aggression, anxiety and negative behaviours, such as defiance and emotional outbursts. Highly competitive games may exacerbate negative behaviours and mood, so participation in these activities should be attempted with close supervision. Games that are less competitive may, however, help pupils with ADHD to develop positive relationships with peers.

A considerable amount of research is necessary to determine the most effective exercise strategies (for example intensity, frequency and duration) to help manage symptoms of ADHD. Current evidence suggests the application of simple skill sessions that are easily mastered will help prevent a reduction in confidence. Short bouts of exercise are also recommended (5-30 minutes) especially when the pupils possess irregular sleeping patterns as a co-morbidity. Aerobic-type sessions possibly reduce severity of ADHD and depressive symptoms, thus improving behaviour, learning and self-confidence. The inclusion of reward schemes to enhance positive social behaviours during PE sessions has been shown to promote a greater sense of social acceptance and improvements within social situations.

Participation in PE and physical activity can have positive and negative effects on children with ADHD; an ETA can facilitate a differentiated and inclusive multi-faceted PE experience, tailored to the child's needs, to enhance all aspects of health, including the physical, mental and social wellbeing of children with ADHD. ■

REFERENCES

ADHD Institute. 2016. *ADHD facts* [Online]. Available: http://www.adhd-institute.com/burden-of-adhd/adhd-facts/. [Accessed 16 March 2016]

Archer, T., Kostrzewa, R.M., Department of Psychology, Psykologiska institutionen, Samhällsvetenskapliga fakulteten, Faculty of Social Sciences. Göteborgs Universitet. 2012. Physical Exercise Alleviates ADHD Symptoms: Regional Deficits and Development Trajectory. *Neurotoxicity Research,* 21(2), 195-209, DOI: 10.1007/s12640-011-9260-0

Barkley, J.E., Salvy, S. Sanders, G.J., Dey, S., Von Carlowitz, K. and Williamson, M.L. 2014. Peer influence and physical activity behavior in young children: an experimental study. *Journal of physical activity & health,* 11(2), 404-409, DOI: 10.1123/jpah.2011-0376

Becker, S.P., Luebbe, A.M., Stoppelbein, L., Greening, L. and Fite, P. J. 2012. Aggression Among Children with ADHD, Anxiety, or Co-occurring Symptoms: Competing Exacerbation and Attenuation Hypotheses. *Journal of Abnormal Child Psychology,* 40(4), 527-542, DOI: 10.1007/s10802-011-9590-7

Berwid, O G. and Halperin, J.M. 2012. Emerging Support for a Role of Exercise in Attention-Deficit/Hyperactivity Disorder Intervention Planning. *Current Psychiatry Reports,* 14(5), 543-551, DOI: 10.1007/s11920-012-0297-4

Bishop, J.C. and Block, M.E. 2012. Positive Illusory Bias in Children with ADHD in Physical Education. *Journal of Physical Education, Recreation & Dance,* 83(9), 43-48.

Bubier, J.L. and Drabick, D.A.G. 2009. Co-occurring anxiety and disruptive behavior disorders: The roles of anxious symptoms, reactive aggression, and shared risk processes. *Clinical Psychology Review,* 29(7), 658-669, DOI: 10.1016/j.cpr.2009.08.005

Carmona, S., Vilarroya, O., Bielsa, A., Trèmols, V., Soliva, J.C., Rovira, M., Tomàs, J., Raheb, C., Gispert, J.D., Batlle, S. and Bulbena, A. 2005. Global and regional gray matter reductions in ADHD: A voxel-based morphometric study. *Neuroscience Letters,* 389(2), 88-93, DOI: 10.1016/j.neulet.2005.07.020

Coates, J. and Vickerman, P. 2008. Let the children have their say: Children with special educational needs and their experiences of physical education – a review. Support for Learning 23(4), 168-175, DOI: 10.1111/j.1467-9604.2008.00390.x

Hansen, B.H., Skirbekk, B., Oerbeck, B., Wentzel-Larsen, T. and Kristensen, H. 2014. Associations between sleep problems and attentional and behavioral functioning in children with anxiety disorders and ADHD. *Behavioral Sleep Medicine,* 12(1) 53-68, DOI:10.1080/15402002.2013.764525

Hoban, T.F. 2000. Sleeplessness in Children with Neurodevelopmental Disorders: Epidemiology and Management. *CNS Drugs,* 14(1), 11-22, DOI: 10.2165/00023210-200014010-00002

Holden, S.E., Jenkins-Jones, S., Poole, C.D., Morgan, C.L., Coghill, D. and Currie, C.J. 2013. The prevalence and incidence, resource use and financial costs of treating people with attention deficit/hyperactivity disorder (ADHD) in the United Kingdom (1998 to 2010). *Child and adolescent psychiatry and mental health,* 7(1), 34-34, DOI: 10.1186/1753-2000-7-34

Hoza, B. and Smith, A.L. 2015. Is aerobic physical activity a viable management strategy for ADHD? *The ADHD Report,* 23(2), 1-5, DOI: 10.1521/adhd.2015.23.2.1

Humphreys, K.L., Katz, S.J., Lee, S.S., Hammen, C., Brennan, P.A. and Najman, J.M. 2013. The Association of ADHD and Depression: Mediation by Peer Problems and Parent-Child Difficulties in Two Complementary Samples. *Journal of Abnormal Psychology,* 122(3), 854-867, DOI: 10.1037/a0033895

Jarrett, M.A., Wolff, J.C., Davis, R.T.E., Cowart, M.J. and Ollendick, T.H. 2016. Characteristics of Children With ADHD and Comorbid Anxiety. *Journal of Attention Disorders,* 20(7), 636-644, DOI: 10.1177/1087054712452914

Johnson, R.C. and Rosen, L.A. 2000. Sports behavior of ADHD children. *Journal of Attention Disorders,* 4(3), 150-160, DOI: 10.1177/108705470000400302

Kiluk, B.D., Weden, S. and Culotta, V.P. 2009. Sport Participation and Anxiety in Children with ADHD. *Journal of Attention Disorders,* 12(6), 499-506, DOI: 10.1177/1087054708320400

Lufi, D. and Parish-Plass, J. 2011. Sport-Based Group Therapy Program for Boys with ADHD or with Other Behavioral Disorders. *Child & Family Behavior Therapy,* 33(3), 217-230, DOI: 10.1080/07317107.2011.596000

McCarthy, S., Wilton, L., Murray, M.L., Hodgkins, P., Asherson, P. and Wong, I.C.K. 2012. The epidemiology of pharmacologically treated attention deficit hyperactivity disorder (ADHD) in children, adolescents and adults in UK primary care. *BMC Pediatrics,* 12(1), 78-78, DOI: 10.1186/1471-2431-12-78

Montgomery, P. and Wiggs, L. 2015. Definitions of sleeplessness in children with attention-deficit hyperactivity disorder (ADHD): implications for mothers' mental state, daytime sleepiness and sleep-related cognitions. *Child: Care, Health and Development,* 41(1), 139-146, DOI: 10.1111/cch.12165

National Health Service. 2014. *Attention deficit hyperactivity disorder (ADHD)* [Online]. Available: http://www.nhs.uk/Conditions/Attention-deficit-hyperactivity-disorder/Pages/Introduction.aspx. [Accessed 3 April 2016]

Neudecker, C., Mewes, N., Reimers, A.K. and Woll, A. 2015. Exercise Interventions in Children and Adolescents With ADHD: A Systematic Review. *Journal of Attention Disorders,* 1-18, DOI: 10.1177/1087054715584053

O'Callaghan, P.M., Reitman, D., Northup, J., Hupp, S.D.A. and Murphy, M.A. 2003. Promoting social skills generalization with ADHD-diagnosed children in a sports setting. *Behavior Therapy,* 34(3), 313-330, DOI: 10.1016/S0005-7894(03)80003-5

Perraton, L.G., Kumar, S. and Machotka, Z. 2010. Exercise parameters in the treatment of clinical depression: A systematic review of randomized controlled trials. *Journal of Evaluation in Clinical Practice,* 16(3), 597-604, DOI: 10.1111/j.1365-2753.2009.01188.x

Robinson, A.M., Hopkins, M.E. and Bucci, D.J. 2011. Effects of physical exercise on ADHD-like behavior in male and female adolescent spontaneously hypertensive rats. *Developmental Psychobiology,* 53(4), 383-390, DOI: 10.1002/dev.20530

Schuch, F.B., Vasconcelos-Moreno, M.P. and Fleck, M.P. 2011. The impact of exercise on Quality of Life within exercise and depression trials: A systematic review. *Mental Health and Physical Activity,* 4(2), 43-48, DOI: 10.1002/dev.20530

Stark, S., Bauer, E., Merz, C.J., Zimmermann, M., Reuter, M., Kirsch, P., Lesch, K. P., Fallgatter, A.J., Vaitl, D. and Hermann, M.J. 2011. ADHD realted behaviors are associated with brain activation in the reward system. *Neuropsychologia,* 49(3), 426-434, DOI: 10.1016/j.neuropsychologia.2010.12.012

Tatsumi, Y., Mohri, I., Shimizu, S., Tachibana, M., Ohno, Y. and Taniike, M. 2015. Daytime physical activity and sleep in pre-schoolers with developmental disorders. *Journal of Paediatrics and Child Health,* 51(4), 396-402, DOI: 10.1111/jpc.12725

THE UK ADHD Partnership. 2013. *ADHD – What is it?* [Online]. Available: http://www.ukadhd.com/what-is-it.htm. [Accessed 12 March 2016]

Tomporowski, P.D. 2016. Exercise and cognition. *Pediatric Exercise Science,* 28(1), 23-27, DOI: 10.1123/pes.2016-0008

Ushijima, H., Usami, M., Saito, K., Kodaira, M. and Ikeda, M. 2012. Time course of the development of depressive mood and oppositional defiant behavior among boys with attention deficit hyperactivity disorder: Differences between subtypes. *Psychiatry and Clinical Neurosciences,* 66(4), 285-291, 10.1111/j.1440-1819.2012.02340.x DOI:

Van Meel, C.S., Heslenfield, D.J., Oosterlaan, J., Luman, M. and Sergeant, J.A. 2011. ERPs associated with monitoring and evaluation of menoetary reward and punishment in children with ADHD. *The Journal of Child Psychology and Psychiatry,* 52(9), 942-953, DOI: 10.1111/j.1469-7610.2010.02352.x

Verret, C., Guay, M.-C., Berthiaume, C., Gardiner, P. and Béliveau, L. 2012. A Physical Activity Program Improves Behavior and Cognitive Functions in Children With ADHD: An Exploratory Study. *Journal of Attention Disorders,* 16(1), 71-80, DOI: 10.1177/1087054710379735

Wigal, S.B., Emmerson, N., Gehricke, J.-G. and Galassetti, P. 2013. Exercise: Applications to Childhood ADHD. *Journal of Attention Disorders,* 17(4), 279-290, DOI: 10.1177/1087054712454192

Daniel Glover is a Graduate in Sport, Exercise and Nutrition Sciences/trainee PE teacher and Louisa Horner is Senior Lecturer in Sport, Exercise and Nutrition Sciences at Huddersfield University.